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SECTION 02515

CONCRETE PAVEMENT

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NOTE: THIS SECTION HAS BEEN PREPARED TO COVER  
CONCRETE PAVING FOR ROADS, STREETS, AND PARKING AREAS  
LESS THAN 100 C.Y. WHERE THE QUANTITY OF PAVING  
EXCEEDS APPROXIMATELY 100 C.Y., OR IF THE PAVING IS  
FOR AIRFIELDS, GUIDE SPECIFICATION CEGS 02513 SHOULD  
BE USED.

THIS SECTION MUST BE USED WITH GUIDE SPECIFICATION  
CEGS-03300, "CONCRETE FOR BUILDING CONSTRUCTION."

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1 GENERAL

1.1 APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ARMY CORPS OF ENGINEERS (COE)

COE CRD-C 572 (1974) Polyvinylchloride Water Stop

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 184 (1990) Fabricated Deformed Steel Bar Mats for  
Concrete Reinforcement

ASTM A 185 (1994) Steel Welded Wire Fabric, Plain; for  
Concrete Reinforcement

ASTM A 497 (1995) Steel Welded Wire Fabric, Deformed,  
for Concrete Reinforcement

ASTM A 499 (1989) Steel Bars and Shapes, Carbon Rolled  
from 'T' Rails

ASTM A 675 (1990a) Steel Bars, Carbon, Hot-Rolled,  
Special Quality, Mechanical Property

ASTM D 1751 (1983; R 191) Preformed Expansion Joint  
Filler for Concrete Paving and Structural  
Construction (Non-Extruding and Resilient  
Bituminous Types)

ASTM D 1752 (1984; R 1992) Preformed Sponge Rubber and  
Cork Expansion Joint Fillers for Concrete  
Paving and Structural Construction

## 1.2 GENERAL

Materials and concrete work for concrete pavement shall conform to the requirements of Section 03300 CONCRETE FOR BUILDING CONSTRUCTION, except as otherwise specified herein or shown on the drawings. All pavement concrete shall be [45 MPa 650 psi flexural strength] [\_\_\_\_ MPa psi compressive strength].

## 1.3 SUBMITTALS

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NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

Indicate submittal classification in the blank space using "GA" when the submittal requires Government approval or "FIO" when the submittal is for information only.

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Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

### SD-01 Data

Equipment and Methods; [\_\_\_\_].

A list of make, type, capacity, and number of all equipment to be used on the job.

### SD-09 Reports

Material Acceptance Testing; [\_\_\_\_].

Manufacturer's certified test reports on epoxy-resin material, showing that specific lots or batches, from which the material for this project is obtained, conform to the requirements of these specifications. Certified copies of aggregate tests and concrete mixture proportioning made by the laboratory, prior to use in the work.

### SD-14 Samples

Material Acceptance Testing; [\_\_\_\_].

Samples of approved aggregates, taken under the supervision of the Contracting Officer in accordance with COE CRD-C 100, accompanied by test reports indicating conformance with grading requirements specified. Samples of materials other than aggregates shall be representative of those proposed for the project and shall be accompanied by the manufacturer's test reports indicating compliance with applicable specified requirements.

### SD-18 Records

Material Acceptance Testing; [\_\_\_\_\_].

Results of tests conducted at the project site, reported weekly within 3 days after the end of each weekly reporting period.

## 2 PRODUCTS

### 2.1 JOINT FILLER

#### 2.1.1 For Expansion Joints

Filler shall be preformed materials conforming to ASTM D 1751 or ASTM D 1752.

#### 2.1.2 For Contraction Joints

Contraction joint inserts shall have sufficient stiffness to permit placement in plastic concrete without undue deviation from a straight line. PVC inserts shall conform to COE CRD-C 572.

### 2.2 REINFORCEMENT

All reinforcement shall be free from loose flaky rust, loose scale, oil, grease, mud, or other coatings that might reduce the bond with concrete. Removal of thin powdery rust and tight rust is not required. However, reinforcing steel which is rusted to the extent that it does not conform to the required dimensions or mechanical properties shall not be used.

#### 2.2.1 Bar Mats

ASTM A 184. The bar members shall be billet, rail, or axle steel, grade 60.

#### 2.2.2 Welded Steel Wire Fabric

ASTM A 185.

#### 2.2.3 Welded Deformed Steel Wire Fabric

ASTM A 497.

#### 2.2.4 Dowels

Plain steel bars conforming to ASTM A 675, grade 80, or ASTM A 499.

## 3 EXECUTION

### 3.1 JOINTS

Joints shall conform to the details indicated and shall be perpendicular to the finished grade of the pavement. Transverse expansion and contraction joints shall be straight and continuous from edge to edge of the pavement.

#### 3.1.1 Construction Joints

a. Longitudinal construction joints: Longitudinal construction joints between paving lanes shall be located as indicated. Dowels, keys or keys and tie bars shall be installed in the longitudinal construction joints or the edges shall be thickened as required and as indicated. When the concrete is placed using stationary forms, metal forms securely fastened to

the concrete form shall be used to form the keyway in the plastic concrete. The dimensions of the keyway forms shall not vary more than plus or minus 3 mm 1/8 inch from the dimensions indicated and shall not deviate more than plus or minus 6 mm 1/4 inch from the mid-depth of the pavement. Longitudinal construction joints shall be edged and subsequently sawed to provide a groove at the top conforming to the details and dimensions indicated.

b. Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for 30 minutes or longer. Insofar as practicable, transverse construction joints shall be installed in the location of a planned joint. When concrete placement cannot be continued, the transverse construction joint may be installed within the slab unit but not less than 3.05 m 10 feet from a planned transverse joint. Transverse construction joints shall be doweled as shown. When the construction joint is located at planned transverse joints, one half of each dowel shall be painted and oiled to permit movement at the joint. These joints shall be edged and subsequently sawed to provide a groove at the top conforming to the details and dimensions indicated. When a construction joint is installed within a slab unit, the dowel bars shall not be painted or oiled, and no groove shall be provided at the joint. When concrete placing is resumed, the planned joint spacing shall be used beginning with the first regularly scheduled transverse joint.

### 3.1.2 Expansion Joints

Expansion joints shall be formed by means of preformed filler material. The filler shall be securely held in position by means of approved metal supports which shall remain in the pavement. A removable metal channel cap bar shall be used to hold the parts of the joint in proper position and protect the filler from damage during concreting operations. The cap bar shall be removable without damage to the pavement to provide a space for sealing of the joint. Adjacent sections of filler shall be fitted tightly together and the filler shall extend across the full width of the paving lane in order to prevent entrance of concrete into the expansion space. Expansion joints shall be formed about structures and features that project through, into, or against pavement, using joint filler of the type, thickness, width indicated, and installed in such manner as to form a complete, uniform separation between the structure and pavement.

### 3.1.3 Contraction joints

Transverse and longitudinal contraction joints shall be of the weakened-plane or dummy type, and shall be constructed as indicated. Longitudinal contraction joints shall be constructed by sawing a groove in the hardened concrete with a power-driven saw in conformance with paragraph "Sawed Joints" below, unless otherwise approved. Transverse contraction joints shall be constructed in conformance with paragraph "Sawed Joints" or "Filler Type Joints" below, unless otherwise approved.

a. Sawed Joints: Sawed joints shall be constructed by sawing a groove in the concrete with a 3 mm 1/8 inch blade to the full depth as indicated. After expiration of the curing period, the upper portion of the groove shall be widened by sawing to the width and depth indicated. The time of sawing shall be varied, depending on existing and anticipated weather conditions, and shall be such as to prevent uncontrolled cracking of the pavement. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting the concrete without chipping, spalling or tearing. The sawed faces of joints will be inspected for undercutting or

washing of the concrete due to the early sawing, and sawing shall be delayed if undercutting is sufficiently deep to cause structural weakness or excessive roughness in the joint. The sawing operation shall be carried on as required during both day and night regardless of weather conditions. The joints shall be sawed at the required spacing consecutively in the sequence of the concrete placement. A chalk line or other suitable guide shall be used to mark the alignment of the joint. The saw cut shall not vary more than 13 mm 1/2 inch from the true joint alignment. Before sawing a joint, the concrete shall be examined closely for cracks, and the joint shall not be sawed if a crack has occurred near the joint location. Sawing shall be discontinued when a crack develops ahead of the saw cut. Workmen and inspectors shall wear clean, rubber-soled footwear, and the number of persons walking on the pavement shall be limited to those actually performing the sawing operation. Immediately after joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly flushed with water until all waste from sawing is removed from the joint. Any membrane-cured surface damaged during the sawing operations shall be resprayed as soon as the surface becomes dry. The sawing equipment shall be adequate in number of units and power to complete the sawing at the required rate. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in the good working order shall be available at the jobsite at all times during the sawing operation.

b. Filler Type Joints: Insert type contraction joints shall be constructed by installation of a preformed insert in the plastic concrete to form a weakened plane to induce cracking. The insert materials shall conform to ASTM D 2828, or COE CRD-C 572, whichever is applicable. The inserts shall be constructed so insert material can be removed to form a groove in the concrete as required in paragraph "Grooving Operation" below. All types of inserts shall be approved prior to installation. Inserts shall be furnished in heights for the various depth of joints shown and in lengths equal to the width of the paving lane.

(1) Equipment: Equipment for installing inserts shall be a machine equipped with a vibratory bar for cutting a groove in the plastic concrete for placement of the insert or for vibrating the insert into place at the prescribed joint location. Installation of the insert shall be to the required depth throughout the full width of the paving lane. The vibration units shall be so arranged that the vibration will be uniformly distributed throughout the bar. The intensity of vibration shall be adjustable as necessary to form a groove of proper size for the filler or forcing the insert into the plastic concrete and for consolidating the concrete around the in-place insert. The vibratory float shall be used following the placement of the insert material in lieu of hand floating or troweling the finish.

(2) Insert installation: The insert shall be installed in the plastic concrete immediately following the final machine finishing with a maximum of two joint spacings between finishing machine and inserter. Additional straightedge and texturing operations shall be accomplished without disturbing the installed insert. Adjacent sections of the joint inserts within each slab unit shall be securely joined together and the insert shall extend across the full width of the slab. The concrete shall be thoroughly consolidated against and for the full depth of the insert. The insert shall be perpendicular to the finished grade of the pavement and shall be straight in alignment at the prescribed joint locations shown, with the top of the insert flush or not more than 3 mm 1/8 inch below the pavement surface. The insert equipment shall be available on the job in good condition prior to the placement of concrete to insure proper vibration and floating.

(3) Grooving operations: After the expiration of the curing period a groove for joint sealer shall be formed as specified below. The top portion of fiberboard fillers or sawable preformed inserts shall be removed by sawing with a power saw to form a groove of required dimensions. The sawing shall be so accomplished as to abrade the concrete surfaces in the joint groove and remove all traces of the filler or insert. Nonsawable insert material shall be removed as prescribed by the manufacturer. The dimensions and characteristics of the groove thus formed shall be as shown on the plans. The grooves shall have edges free of ravel and spalls. The grooves shall be straight from edge to edge of the pavement and shall not vary more than 50 mm 1/2 inch from alignment.

#### 3.1.4 Sealing Joints

Joints shall be sealed immediately following curing of the concrete or as shown thereafter as weather conditions permit, as directed. Sawing of filler-type joints shall be accomplished immediately before sealing of the joints. Joints shall be sealed as specified in Section 02592 FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS.

#### 3.1.5 Grooving and Sealing Cracks

Random cracks, except those specifically excluded by the Contracting Officer, that occur in the pavement during construction shall be grooved and sealed. The top of the crack shall be grooved to a depth of 19 mm 3/4 inch and to a width not less than 10 mm 3/8 inch nor more than 16 mm 5/8 inch means of an approved mechanical grooving machine. The grooving tool shall be capable of following closely the path of the crack and of widening the top of the crack to the required section without spalling or otherwise damaging the concrete. Loose and fractured concrete shall be removed, and the groove shall be thoroughly cleaned and completely filled with approved joint sealing material of the type required for the area in which the crack occurs. No separate payment will be made for grooving, cleaning, and sealing of cracks.

### 3.2 FINISH FOR PAVEMENT

The pavement shall be struck off to grade and immediately straightedged with a 10-ft. straightedge in both directions. Floating shall be started after the surface has been straightedged and all the surface water has disappeared. The initial floating may be performed by use of power-driven equipment. The final surface texture of the pavement shall be provided by means of a burlap drag, or broom as approved.

#### 3.1.6 Burlap-Drag Texture

Surface texture shall be applied by dragging the surface of the pavement, in the direction of the concrete placement, with an approved multiple-ply burlap drag at least three feet in width and equal in length to the width of a slab. The leading transverse edge of the drag shall be securely fastened to a lightweight pole or travelling bridge, and at least one foot of the burlap shall be in contact with the pavement during dragging operation. The drag shall be operated with the burlap moist and the burlap shall be cleaned and changed as required. The dragging shall be done so as to produce a uniform finished surface having a fine sandy texture without disfiguring marks.

#### 3.2.2 Broom Texturing

Surface texture shall be applied using an approved hand or mechanical stiff bristle broom of a type that will produce uniform corrugations. For hand brooming the brooms shall have handles longer than half the width of slab to be finished. The hand brooms shall be drawn transversely across the surface from the centerline to each edge with slight overlapping strokes. For mechanical operations the broom shall be operated with the length of the broom parallel to the pavement centerline. The broom shall be capable of traversing the full width of the pavement in a single pass at a uniform speed and with a uniform pressure. Successive passes of the broom shall be overlapped the minimum necessary to obtain a uniformly textured surface. Brooms shall be washed thoroughly and dried at frequent intervals during use. Worn or damaged brooms shall be removed from the job site. Brooming should be completed before the concrete has dried to the point where the surface will be unduly torn or roughened, but after drying has progressed enough so that the mortar will not flow and attenuate the sharpness of the corrugations. The corrugations should be uniform in appearance and approximately 2 mm 1/16 in. in depth but not more than 3 mm 1/8 in. in depth.

### 3.2 SURFACE TEST

After the concrete curing period, the surface of the paving shall be tested with a straightedge or device which shall be operated in such manner as to reveal any irregularities. Any portion of the pavement which shows a variation or departure greater than 3 mm 1/8-inch from the testing edge of a 3.05 m 10-foot straightedge, shall be removed and replaced or corrected as directed by the Contracting Officer.

### 3.3 CURING AND PROTECTION

The Contractor shall protect the pavement against all damage prior to final acceptance of the work by the Government. Traffic shall be excluded from the pavement until the concrete is at least 14 days old, or for a longer period if so directed by the Contracting Officer. Curing of concrete shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION, of these specifications.

### 3.4 PAVEMENT THICKNESS

The pavement shall be constructed in accordance with the thickness shown on the drawings. No variation in thickness of over 6 mm 1/4-inch will be permitted. If a variation in thickness occurs and, in the opinion of the Contracting Officer, is sufficient to seriously impair the service expected from the pavement, the deficient area shall be removed and replaced with a slab of quality and thickness satisfactory to the Contracting Officer. The Contracting Officer may allow the Contractor the choice of leaving the defective section in place and receiving no compensation or payment for same, or of removing and replacing the pavement as provided above.

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NOTE: WHEN CONCRETE CURBS ARE TO BE CONSTRUCTED MONOLITHICALLY WITH THE PAVING OF THE STREET OR PARKING AREA, THE PARAGRAPH "INTEGRAL OR MONOLITHIC CURBS" SHOULD BE RETAINED. WHEN THE CURBS AND GUTTERS ARE CONSTRUCTED WITH BITUMINOUS PAVING, GUIDE SPECIFICATION CEGS-02511 SHOULD BE USED AND THE PARAGRAPH ENTITLED "INTEGRAL OR MONOLITHIC CURBS" SHOULD BE DELETED.  
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### 3.6 INTEGRAL OR MONOLITHIC CURBS

#### 3.4.1 General

Integral or monolithic curbs shall be constructed to the dimensions and at the locations indicated. Curbs shall be constructed of portland-cement concrete conforming with these specifications except as modified herein. The maximum nominal size of the coarse aggregate for curb construction shall be 38 mm 1-1/2 inches.

#### 3.4.2 Forms for Integral or Monolithic Curbs

Forms for the curbs shall be of similar material to that used for the pavements. The outside form shall be of a depth equal to the combined depth of the integral curb and pavement slab. The form may be a built-up section, the lower portion equal to the depth of the pavement slab and the upper portion equal to the depth of the integral curb. The built-up form shall be so designed as to assure rigid connection between the lower and upper portions. The inside curb-face form shall have a batter from the top of the curb to the finished pavement surface as indicated. The inside curb form shall be securely fastened to and supported by the outside form. The fastenings shall be so designed as not to obstruct satisfactory finishing and edging of the top of the curb and to permit early removal of the face form.

#### 3.4.3 Placing

The concrete curb shall be placed as soon as practical after the slab is placed but in no case shall the time between the placing of the slab and the placing of the curb exceed 45 minutes. The concrete shall be thoroughly spaded or vibrated until well compacted and until a good bond is obtained between the curb and the slab.

If it is impractical to complete the integral curb simultaneously with the pavement slab, deformed tie bars, 16 mm 5/8-inch in diameter and 175 mm 7 inches in length, shall be embedded vertically in the slab at 1-foot intervals and so as to extend 50 mm 2 inches into the curb. While the slab is still green, the surface shall be dapped approximately 25 mm 1 inch below the screeded surface for the full width of the curb leaving a recess with a roughened surface to provide bond for the curb section.

Transverse joints shall be of the type and construction specified for transverse joints for the pavement slab on which the curb is placed. Pavement joints shall extend through the curb with the exception that horizontal dowels will not be required between joints in the curb.

#### 3.4.4 Finishing

The top of the curb shall be floated in such manner as to thoroughly compact the concrete and produce a smooth even surface. The edges of the curb and joints shall be rounded by using appropriate edging tools. Vertical edges of joints shall be dressed when the curb form is removed. While the concrete is green, the top and face of the curb shall be finished by rubbing the surface with a wood or concrete rubbing block and water until all blemishes, form marks, and tool marks have been removed. Ample water shall be used during the rubbing to avoid a plastered condition. The rubbed surface shall then be brushed with a fine-textured brush to obtain a uniform surface texture. The face of the finished curb shall be true and straight. The top surface of the curb shall be of uniform width, free from humps, sags, and other irregularities. The top and face of the curb shall not vary more than 3 mm



1/8-inch from the edge of a 3.05 m 10-foot straightedge, except at grade changes or curves. Visible surfaces and edges of the finished curb shall be free of blemishes, form and tool marks, and shall be uniform in color, shape, and appearance.

--End of Section--